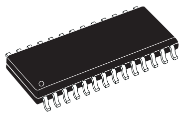
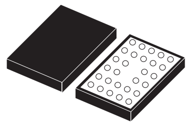
ST3243E

±15KV ESD PROTECTED 3 TO 5.5V, 400KBPS, RS-232 TRANSCEIVER WITH AUTO-POWERDOWN

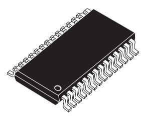
- ESD PROTECTION FOR RS-232 I/O PINS: ±8KV IEC 1000-4-2 CONTACT DISCHARGE ±15KV HUMAN BODY MODEL
- 1µA SUPPLY CURRENT ACHIEVED WHEN IN AUTO-POWERDOWN
- 250Kbps MINIMUM GUARANTEED DATA RATE
- GUARANTEED 6V/µs SLEW RATE RANGE
- GUARANTEED MOUSE DRIVEABILITY
- 0.1µF EXTERNAL CAPACITORS
- MEET EIA/TIA-232 SPECIFICATIONS DOWN TO 3V
- AVAILABLE IN SO-28, SSOP-28, TSSOP28 AND FLIP-CHIP28 PACKAGES



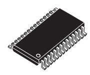
SOP



Flip-Chip28



SSOP



TSSOP

DESCRIPTION

The ST3243E device consists of 3 drivers, 5 receivers and a dual charge-pump circuit. The device meets the requirements of EIA/TIA and V.28/V.24 comunication standards providing high data rate capability and enhanced electrostatic discharge (ESD) protection. All transmitter outputs and receiver input are protected to ±8KV USING IEC 1000-4-2 contact discharge and ±15KV using the Human Body Model. The receiver R2 is always active to implement a wake-up feature for serial port.

The ST3243E has a proprietary low-dropout transmitter output stage enabling true RS-232 performance from a 3.0V to 5.5V supply with a dual charge pump. The device is guaranteed to run at data rates of 250kbps while maintaining RS-232 output levels.

The Auto-powerdown feature functions when FORCEON is low and $\overline{\text{FORCEOFF}}$ is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If $\overline{\text{FORCEOFF}}$ is set low, both drivers and receivers (expert R2B) are shut off, and supply current is reduced to 1µA. Disconnecting the serial port or turning off the peripheral drives causes the auto-powerdown condition to occur.

Auto-powerdown can be disabled when FORCEON and $\overline{\text{FORCEOFF}}$ are high, and should be done when driving a serial mouse. With Auto-powerdown enabled, the device is activated automatically when a valid signal is applied to any receiver input.

Typical application are in notebook, subnotebook, palmtop computers, battery-powered equipment, hand-held equipment, peripherals and printers.

ORDERING CODES

Type	Temperature Range	Package	Comments
ST3243ECD	0 to 70 °C	SO-28 (Tube)	27parts per tube / 12tube per box
ST3243EBD	-40 to 85 °C	SO-28 (Tube)	27parts per tube / 12tube per box
ST3243ECDR	0 to 70 °C	SO-28 (Tape & Reel)	1000 parts per reel
ST3243EBDR	-40 to 85 °C	SO-28 (Tape & Reel)	1000 parts per reel
ST3243ECPR	0 to 70 °C	SSOP-28 (Tape & Reel)	1350 parts per reel
ST3243EBPR	-40 to 85 °C	SSOP-28 (Tape & Reel)	1350 parts per reel
ST3243ECTR	0 to 70 °C	TSSOP28 (Tape & Reel)	2500 parts per reel
ST3243EBTR	-40 to 85 °C	TSSOP28 (Tape & Reel)	2500 parts per reel
ST3243ECJ	0 to 70 °C	FLIP-CHIP28	coming soon
ST3243EBJ	-40 to 85 °C	FLIP-CHIP28	coming soon

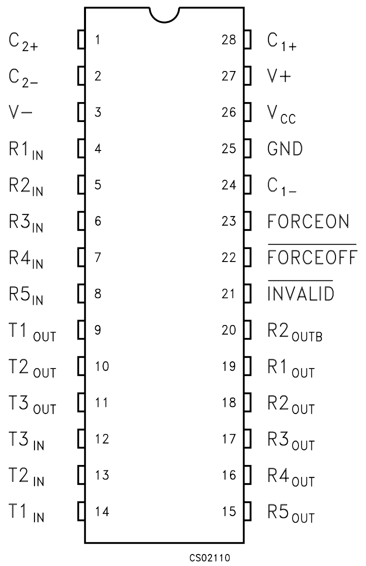
PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
1	C_2+	Positive Terminal of Inverting Charge Pump Capacitor
2	C_2-	Negative Terminal of Inverting Charge Pump Capacitor
3	V-	-5.5V Generated by the Charge Pump
4	$R1_{IN}$	First Receiver Input Voltage
5	$R2_{IN}$	Second Receiver Input Voltage
6	$R3_{IN}$	Third Receiver Input Voltage
7	$R4_{IN}$	Fourth Receiver Input Voltage
8	$R5_{IN}$	Fifth Receiver Input Voltage
9	$T1_{OUT}$	First Transmitter Output Voltage
10	$T2_{OUT}$	Second Transmitter Output Voltage
11	$T3_{OUT}$	Third Transmitter Output Voltage
12	$T3_{IN}$	Third Transmitter Input Voltage
13	$T2_{IN}$	Second Transmitter Input Voltage
14	$T1_{IN}$	First Transmitter Input Voltage
15	$R5_{OUT}$	Fifth Receiver Output Voltage
16	$R4_{OUT}$	Fourth Receiver Output Voltage
17	$R3_{OUT}$	Third Receiver Output Voltage
18	$R2_{OUT}$	Second Receiver Output Voltage
19	$R1_{OUT}$	First Receiver Output Voltage
20	$R2_{OUTB}$	Non-inverting Complementary Receiver Output, always active for wake-up
21	$\overline{\text{INVALID}}$	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1"
22	$\overline{\text{FORCEOFF}}$	Drive low to shut down transmitters and on-board power supply. This over-rides all automatic circuitry and FORCEON
23	FORCEON	Drive high to override automatic circuitry keeping transmitters on ($\overline{\text{FORCEOFF}}$ must be high)
24	C_1-	Negative Terminal of Voltage- Charge Pump Capacitor
25	GND	Ground
26	V_{CC}	Supply Voltage
27	V+	5.5V Generated by the Charge Pump
28	C_1+	Positive Terminal of Voltage- Charge Pump Capacitor

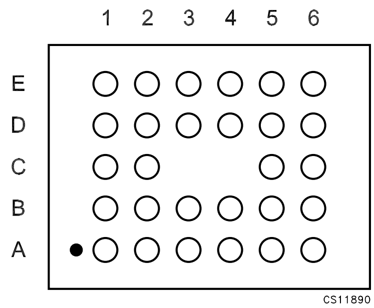
PIN DESCRIPTION

PIN N°	SYMBOL	NAME AND FUNCTION
A1	$R2_{IN}$	Second Receiver Input Voltage
A2	$R3_{IN}$	Third Receiver Input Voltage
A3	$R4_{IN}$	Fourth Receiver Input Voltage
A4	$R5_{IN}$	Fifth Receiver Input Voltage
A5	$T1_{OUT}$	First Transmitter Output Voltage
A6	$T2_{OUT}$	Second Transmitter Output Voltage
B1	V-	-5.5V Generated by the Charge Pump
B2	$R1_{IN}$	First Receiver Input Voltage
B3	$T3_{OUT}$	Third Transmitter Output Voltage
B4	$T3_{IN}$	Third Transmitter Input Voltage
B5	$T1_{IN}$	First Transmitter Input Voltage
B6	$T2_{IN}$	Second Transmitter Input Voltage
C1	C_2+	Positive Terminal of Inverting Charge Pump Capacitor
C2	C_2-	Negative Terminal of Inverting Charge Pump Capacitor
C5	$R4_{OUT}$	Fourth Receiver Output Voltage
C6	$R5_{OUT}$	Fifth Receiver Output Voltage
D1	C_1+	Positive Terminal of Voltage- Charge Pump Capacitor
D2	V+	5.5V Generated by the Charge Pump
D3	V_{CC}	Supply Voltage
D4	FORCEON	Drive high to override automatic circuitry keeping transmitters on ($\overline{\text{FORCEOFF}}$ must be high)
D5	$R1_{OUT}$	First Receiver Output Voltage
D6	$R3_{OUT}$	Third Receiver Output Voltage
E1	GND	Ground
E2	C_1-	Negative Terminal of Voltage- Charge Pump Capacitor
E3	$\overline{\text{FORCEOFF}}$	Drive low to shut down transmitters and on-board power supply. This over-rides all automatic circuitry and FORCEON
E4	$\overline{\text{INVALID}}$	Output of the valid signal detector. Indicates if a valid RS-232 level is present on receiver inputs logic "1"
E5	$R2_{OUTB}$	Non-inverting Complementary Receiver Output, always active for wake-up
E6	$R2_{OUT}$	Second Receiver Output Voltage

PIN CONFIGURATION



SOP, SSOP, TSSOP
(top view)



FLIP-CHIP 6x5
(bottom view, bumps side)

INVALID TRUTH TABLE

RS-232 SIGNAL PRESENT AT ANY RECEIVER INPUT	$\overline{\text{INVALID}}$ OUTPUT
YES	H
NO	L

OUTPUT CONTROL TRUTH TABLE

FORCE ON	FORCE OFF	VALID RECEIVER LEVEL	OPERATION STATUS	T_{OUT}	R_{OUT}	R_{2OUTB}
X	0	X	Shutdown (Force OFF)	HIGH Z	HIGH Z	ACTIVE
1	1	X	Normal Operating (Force ON)	ACTIVE	ACTIVE	ACTIVE
0	1	YES	Normal Operating (Auto-powerdown)	ACTIVE	ACTIVE	ACTIVE
0	1	NO	Shutdown (Auto-power-down)	HIGH Z	ACTIVE	ACTIVE

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.3 to 6	V
V+	Doubled Voltage Terminal	(V_{CC} -0.3) to 7	V
V-	Inverted Voltage Terminal	0.3 to -7	V
V+ +|V-|		13	V
$\overline{\text{FORCEON}}$, FORCEOFF, T_{IN}	Input Voltage	-0.3 to 6	V
R_{IN}	Receiver Input Voltage Range	± 25	V
T_{OUT}	Transmitter Output Voltage Range	± 13.2	V
R_{OUT} R_{OUTB} INVALID	Receiver Output Voltage Range	-0.3 to (V_{CC} + 0.3)	V
t_{SHORT}	Short Circuit Duration on T_{OUT} (one at a time)	Continuous	
T_{stg}	Storage Temperature Range	-65 to 150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

ESD PERFORMANCE: TRANSMITTER OUTPUTS, RECEIVER INPUTS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
ESD	ESD Protection Voltage	Human Body Model	± 15			KV
ESD	ESD Protection Voltage	IEC 1000-4-2 (Contact Discharge)	± 8			KV

ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{ASHDN}	Supply Current Auto-powerdown	$\overline{\text{FORCEOFF}}$ = GND$\overline{\text{FORCEON}}$ = V_{CC} All R_IN open or grounded		1	10	µA
I_{SUPPLY}	Supply Current	FORCEON = $\overline{\text{FORCEOFF}}$ = V_{CC}		0.3	1	mA
I_{SHDN}	Shutdown Supply Current	$\overline{\text{FORCEOFF}}$ = GND		1	10	µA

LOGIC INPUT ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TIL}	Input Logic Threshold Low	T-IN, FORCEON, $\overline{\text{FORCEOFF}}$			0.8	V
V_{TIH}	Input Logic Threshold High	T-IN, FORCEON, $\overline{\text{FORCEOFF}}$ V_{CC} = 3.3V V_{CC} = 5V	2 2.4			V V
V_{THYS}	Transmitter Input Hysteresis			0.5		V
I_{IL}	Input Leakage Current	T-IN, FORCEON, $\overline{\text{FORCEOFF}}$		± 0.01	± 1.0	µA
I_{OL}	Output Leakage Current	Receiver Disabled		± 0.05	± 10	µA
V_{OL}	Output Voltage Low	I_{OUT} = 1.6mA			0.4	V
V_{OH}	Output Voltage High	I_{OUT} = -1mA	V_{CC}-0.6	V_{CC}-0.1		V

AUTO-POWERDOWN ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C, FORCEON = GND, $\overline{FORCEOFF}$ = V_{CC})

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{RITE}	Receiver Input Threshold to INVALID Output Voltage HIGH (Fig. 1)	Positive Threshold			2.7	V
		Negative Threshold	2.7			V
V_{RITD}	Receiver Input Threshold to INVALID Output Voltage LOW (Fig. 1)		-0.3		0.3	V
V_{IOL}	INVALID Output Voltage LOW	I_{OUT} = 1.6mA			0.4	V
V_{IOH}	INVALID Output Voltage HIGH	I_{OUT} = -1mA	V_{CC}-0.6			V
t_{WU}	Receiver or Transmitter Edge Transmitter Enabled (Fig. 1)			100		µs
t_{invh}	Receiver Positive or Negative Threshold to INVALID HIGH (Fig. 1)			0.2		µs
t_{invL}	Receiver Positive or Negative Threshold to INVALID LOW (Fig. 1)			30		µs

TRANSMITTER ELECTRICAL CHARACTERISTICS

(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{TOUT}	Output Voltage Swing	All Transmitter outputs are loaded with 3KΩ to GND	± 5	± 5.4		V
R_{OUT}	Output Resistance	V_{CC} = V+ = V- = 0V V_{OUT} = ± 2V	300	10M		Ω
I_{SC}	Output Short Circuit Current	V_{CC} = 3.3V		± 40	± 60	mA
I_L	Output Leackage Current	V_{CC} = 0 to 5.5V, trasmitter output = ± 12V, trasmitter disabled			± 25	mA
V_{OT}	Transmitter Output Voltage	T1IN = T2IN = GND, T3IN = V_{CC} T3OUT loaded with 3KΩ to GND T1OUT and T2OUT loaded with 2.5mA each	± 5			V

RECEIVER ELECTRICAL CHARACTERISTICS

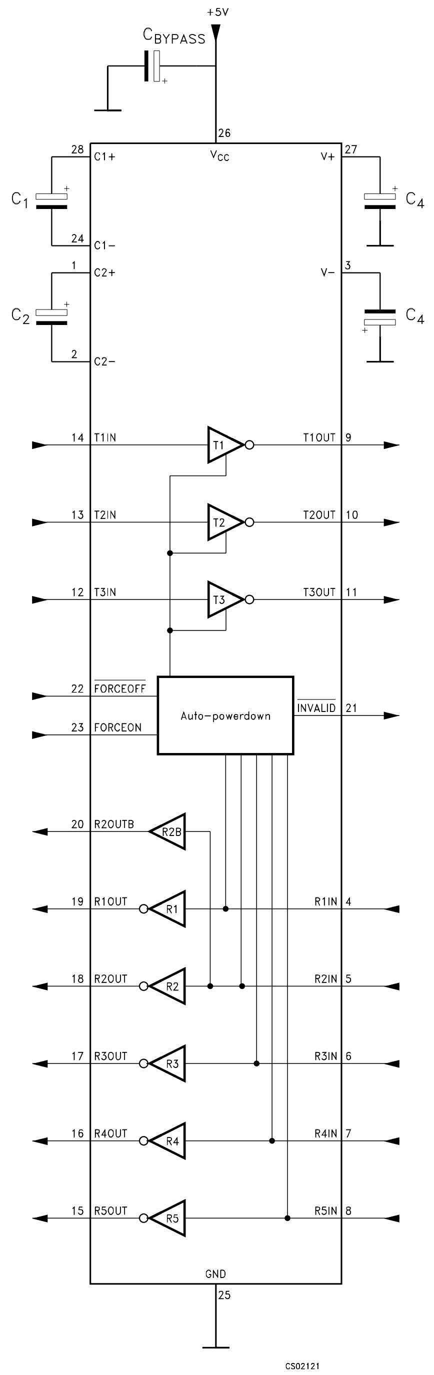
(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified. Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{RIN}	Receiver Input Voltage Operating Range		-25		25	V
V_{RIL}	RS-232 Input Threshold Low	T_A = 25°C V_{CC} = 3.3V T_A = 25°C V_{CC} = 5.0V	0.6 0.8	1.1 1.4		V
V_{RIH}	RS-232 Input Threshold High	T_A = 25°C V_{CC} = 3.3V T_A = 25°C V_{CC} = 5.0V		1.6 1.9	2.4 2.4	V
V_{RIHYS}	Input Hysteresis			0.5		V
R_{RIN}	Input Resistance	T_A = 25°C	3	5	7	KΩ

TIMING CHARACTERISTICS
(C_1 - C_4 = 0.1µF, V_{CC} = 3V to 5.5V, T_A = -40 to 85°C, unless otherwise specified.
Typical values are referred to T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
D_R	Maximum Data Rate	R_L = 3KΩ C_L= 1000pF one trasmitter switching	250	400		Kbps
t_{PHL} t_{PLH}	Receiver Propagation Delay	R_{IN} to R_{OUT} C_L = 150pF		0.15		µs
t_{T_SKEW}	Transmitter Skew			150		ns
t_{R_SKEW}	Receiver Skew			70		ns
S_{RT}	Transition Slew Rate	T_A = 25°C R_L = 3K to 7KΩ V_{CC} = 3.3V measured from +3V to -3V or -3V to +3V C_L = 150pF to 1000pF C_L = 150pF to 2500pF	 6 4		 30 30	 V/µs V/µs

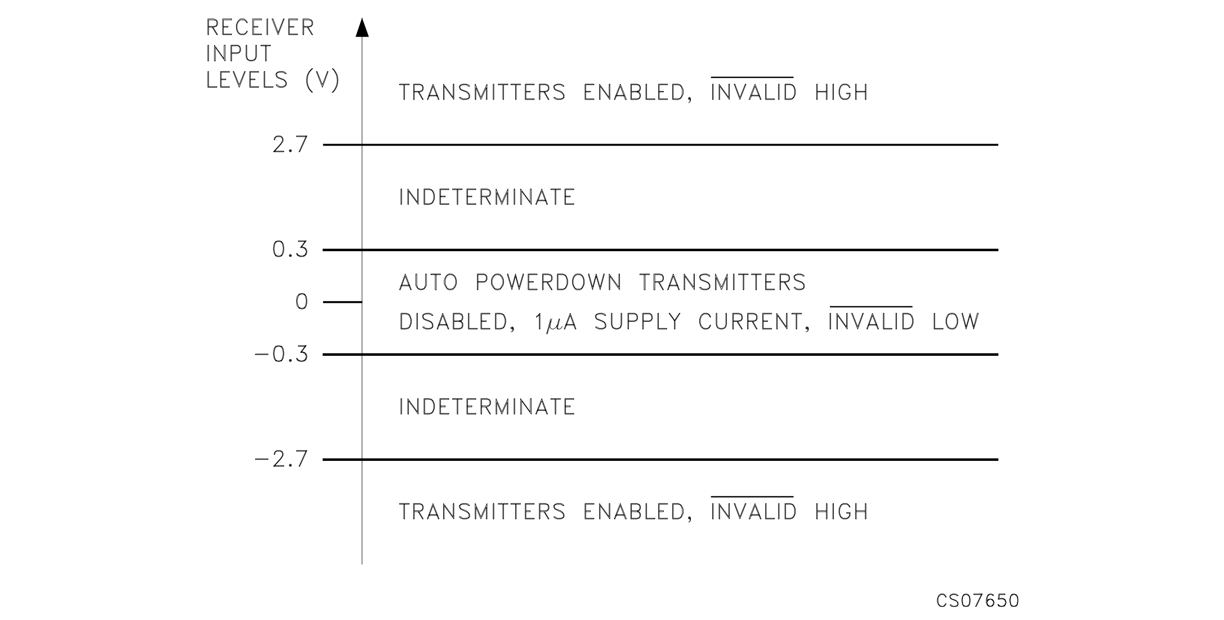
APPLICATION CIRCUITS



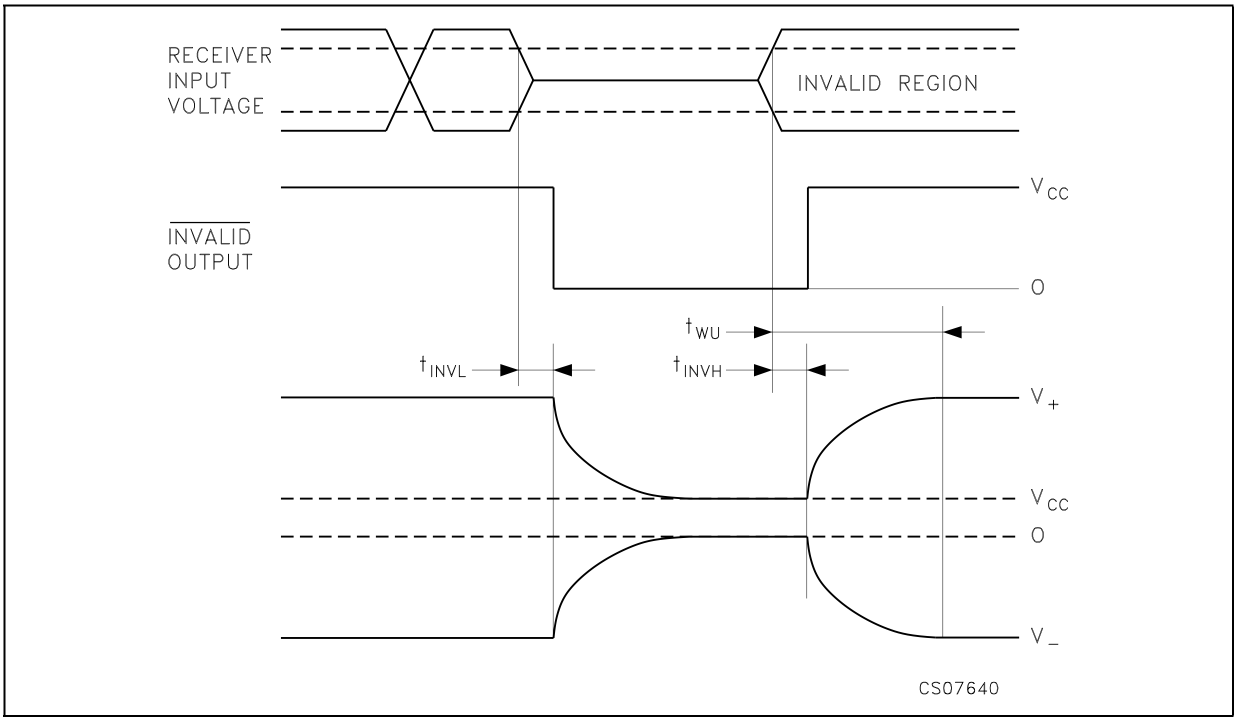
REQUIRED MINIMUM CAPACITANCE VALUE (μF)

V_{CC} (V)	C_1	C_2, C_3, C_4, C_{BYPASS}
3 to 3.6	0.1	0.1
4.5 to 5.5	0.047	0.33

AUTOPOWERDOWN INPUT LEVELS

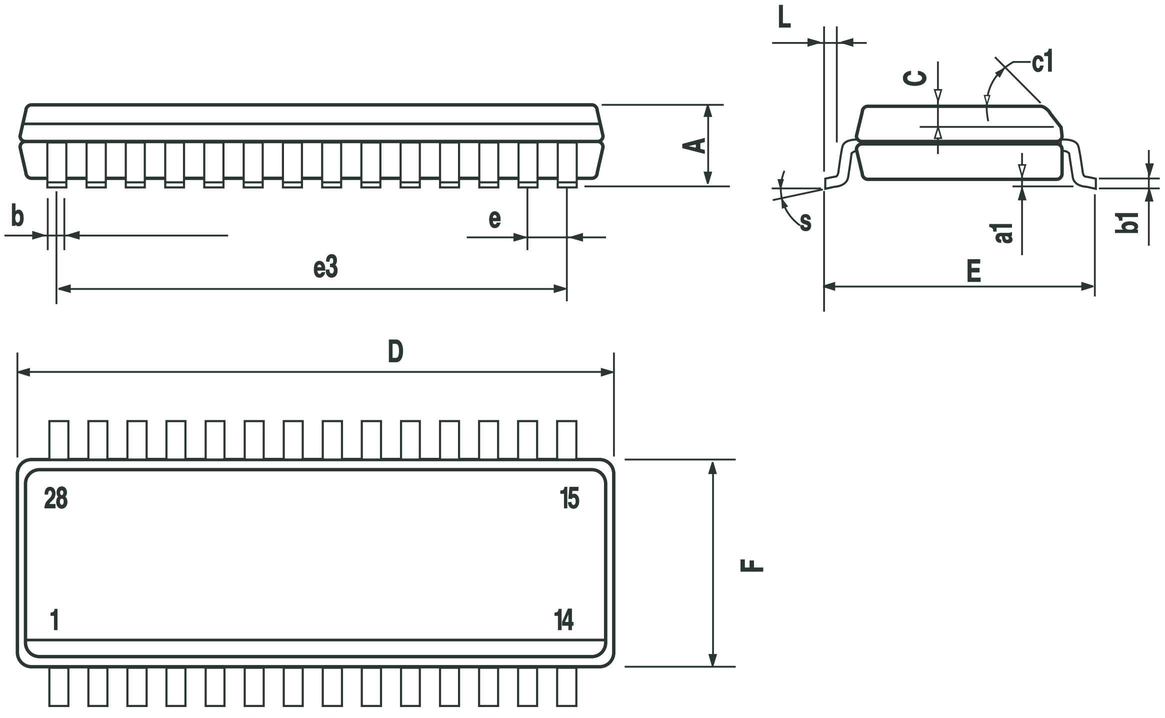


AUTOPOWERDOWN INPUT TIMING



SO-28 MECHANICAL DATA

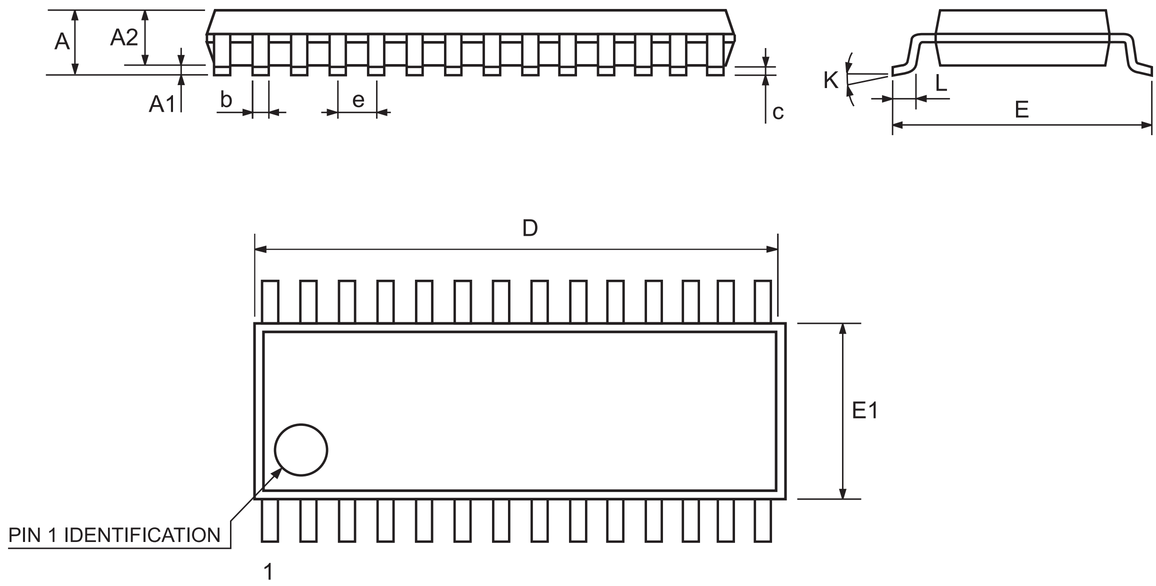
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	17.70		18.10	0.697		0.713
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		16.51			0.650	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
S	8° (max.)					



0016023

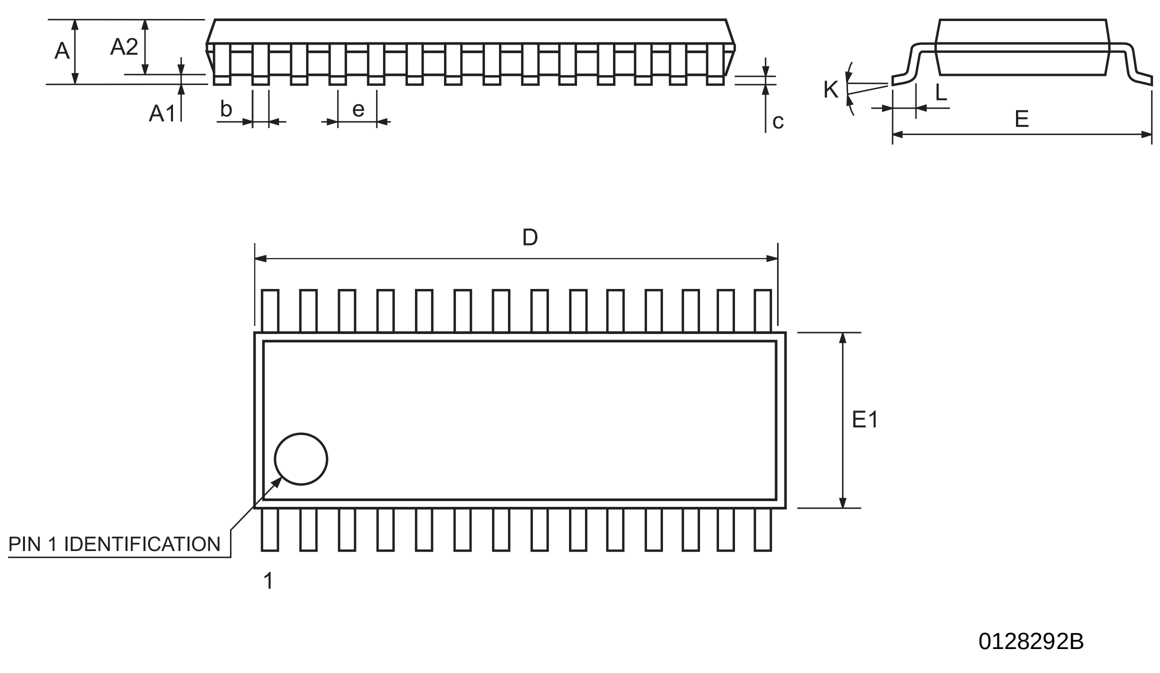
SSOP28 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2			0.079
A1	0.050			0.002		
A2	1.65	1.75	1.85	0.065	0.069	0.073
b	0.22		0.38	0.009		0.015
c	0.09		0.25	0.004		0.010
D	9.9	10.2	10.5	0.390	0.402	0.413
E	7.4	7.8	8.2	0.291	0.307	0.323
E1	5	5.3	5.6	0.197	0.209	0.220
e		0.65 BSC			0.0256 BSC	
K	0°		10°	0°		10°
L	0.55	0.75	0.95	0.022	0.030	0.037



TSSOP28 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	9.6	9.7	9.8	0.378	0.382	0.386
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



Flip-Chip28 MECHANICAL DATA

DIM.	mm.			mils		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	0.58		0.95	22.8		37.4
A1		0.24			9.4	
A2		0.65			25.6	
b	0.25	0.30	0.35	9.8	11.8	13.8
D	3.97		4.17	156.3		164.2
D1		2.5			98.4	
E	2.47		2.67	97.2		105.1
E1		2			78.7	
e	0.45		0.55	17.7		21.7
f	0.23		0.34	9.1		13.4
f1	0.80		0.91	31.5		31.8

